Sandeep Kumar

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Education

M.Tech in Computational and Data Science **2024 – 2026**
Indian Institute of Science, Bangalore *CGPA: 8.40/10*

B.Tech in Mechanical Engineering **2019 – 2023**
Aligarh Muslim University, Aligarh *CGPA: 8.62/10*

Relevant Coursework

- Natural Language Processing (A)
- Machine Learning for DS (A)
- Numerical Optimization (A)
- Digital Image Processing (A)
- Intro to Scalable Systems (B+)
- Numerical Linear Algebra (B)

Work Experience

Graduate Engineer Trainee, Siemens Ltd. **Jul 2023 – Jul 2024**

- Contributed to a live project on a 600MW combined cycle power plant, including piping design for the gas turbine building.

Projects

Out-of-Distribution Detection in Vision-Language Models for Medical Imaging **Apr 2025 - Ongoing**

- Extended **MCM**, **GLMCM**, and **Joint Energy-based** OOD methods to multi-label medical imaging on **MURA**, **IRMA**, and **Boneage**.
- Adapted **CoOp**, **LoCoOp**, **PLOT**, **DualCoOp**, **DualCoOp++**, and **Gallop** to medical images.

Credit Card Fraud Detection using Machine Learning Models **Jun 2025 - Jun 2025**

- Performed Exploratory Data Analysis, explored undersampling and **SMOTE** to handle problem of **class imbalance**.
- Compared performance of **Logistic Regression**, KNN classifier, SVM, **Random Forest** and XGBoost.

Statistical Evaluation of Deep Learning vs. Traditional ML for Classificatio n **Apr 2025 – Apr 2025**

- Trained a **CNN** model for image classification and a **U-Net** model for image segmentation on a leaf dataset.
- Applied **PCA** to reduce image dimensionality and used the transformed features to train an **XGBoost** classifier for comparison with deep learning models.

Hindi-to-English Neural Machine Translation using Sequence-to-Sequence Models **Mar 2025 - Mar 2025**

- Implemented a **Seq2Seq model** using **LSTM**-based encoder-decoder architecture with **attention mechanism** and **Byte-Pair Encoding(BPE) tokenizer** to translate names from English to Hindi.

Optimization and Computational Modeling in Energy Systems and Finance **Mar 2025 – Apr 2025**

- Built a coal-plant efficiency model using **batch**, **mini-batch GD**, and **ADAM**; plotted objectives and paths.
- Optimized plant parameters using **Newton**, **BFGS**, and **Conjugate Gradient** methods.
- Designed a **linear programming** model for cash-flow optimization; validated via the **in-built simplex method**.
- Used the **Metropolis–Hastings algorithm** to minimize Rosenbrock function and plot convergence.

MLP, CNN and Vision Transformer from Scratch for Image Classification **Feb 2025 - Feb 2025**

- Implemented modular vector backpropagation, **MLP**, and **CNN** from scratch using **Numpy** for image classification on the CIFAR-10 dataset.

Technical Skills

Programming Languages and Libraries: Python, C++
Tools: Numpy, Pandas, Matplotlib, Pytorch, Sci-kit Learn.
Technical: Machine Learning, Natural Language Processing, Deep Learning, Image Processing, Computer Vision.

Academic Accomplishments

- Achieved **86.2%** in Bachelor of Technology with **Honors**.
- Revised **Machine Learning (DS216)** materials on **Neural Networks** and **Convolutional Neural Networks**.
- Teaching Assistant for **"AI in Healthcare: Theory to Practice"** by **IISc** and **Aster Hospitals**.